AN

Account of the GOING, during THIRTEEN MONTHS,

AT THE

Royal Obſervatory at Greenwich,

OF

A POCKET CHRONOMETER,

Invented and Made by

JOHN ARNOLD,

Publiſhed with Permiſſion of the BOARD of LONGITUDE.

LONDON, 1780.

Sold by JOHN ARNOLD, No. 2, *Adam-Street*, ADELPHI.

[Price

Communicated by

Sr. W. Musgrave. 1790

The Going of *Arnold's* POCKET CHRONOMETER from Day to Day in different Positions.

Day of the Month.			Daily Rate of the Chronometer.	
1779.			S.	
M	February	1	+ 0,79	Worn in the Pocket.
Tu	. . .	2	— 0,15	
W	. . .	3	+ 0.15	
Th	. . .	4	0,00	
F	. . . .	5	— 1,16	
Sa	. . .	6	+ 1,34	
Su	. . .	7	0,81	
M	. . .	8	— 0,26	
Tu	. . .	9	+ 0,56	
W	. . .	10	0,07	
Th	. . .	11	— 0,45	
F	. . .	12	0,39	
Sa	. . .	13	0,25	
Su	. . .	14	0,35	— 0,31 Mean Rate of 28 Days, which is made Use of in the Fourth Column of what follows.
M	. . .	15	1,48	
Tu	. . .	16	+ 0,09	
W	. . .	17	0,30	
Th	. . .	18	— 0,58	
F	. . .	19	0,77	
Sa	. . .	20	0,90	
Su	. . .	21	0,00	
M	. . .	22	1,55	
Tu	. . .	23	0,48	
W	. . .	24	0,76	
Th	. . .	25	0,29	
F	. . .	26	0,68	
Sa	. . .	27	1,74	
Su	. . .	28	0,49	

The Going of the *Chronometer* from Day to Day in different Positions.

+ 0,35 Vertical Position, Hour 12 highest.

— 0,35 Vertical Position, Hour 3 highest.

3,85 Vertical Position, Hour 6 highest.

0,29 Vertical Position, Hour 9 highest.

2,83 Horizontal Position, Face downwards.

1,72 Horizontal Position, Face upwards.

Day of the Month.		Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.	Day of the Month.		Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.
1779.		S.	M. S.	M. S.	M. S.	1779.		S.	M. S.	M. S.	M. S.
M	March 1	— 1,86	0. 1,86	0. 0,31	0. 1,6	*Th*	April 1	— 1,39	0.41,23	0. 9,30	0.31, 9
Tu	2	0,80	0. 2,66	0. 0,62	0. 2,0	*F*	2	2,59	0.43,82	0. 9,61	0.34, 2
W	3	0,85	0. 3,51	0. 0,93	0. 2,6	*Sa*	3	1,75	0.45,57	0. 9,91	0.35, 6
Th	4	1,72	0. 5,23	0. 1,24	0. 4,0	*Su*	4	1,42	0.46,99	0.10,23	0.36, 8
F	5	0,23	0. 5,46	0. 1,55	0. 3,9	*M*	5	2,39	0,49,38	0.10,54	0.38, 8
Sa	6	1,34	0. 6,80	0. 1,86	0. 4,9	*Tu*	6	1,72	0.51,10	0.10,85	0.40, 2
Su	7	1,07	0. 7,87	0. 2,17	0. 5,7	*W*	7	1,69	0.52,79	0.11,16	0.41, 6
M	8	0,86	0. 8,73	0. 2,48	0. 6,2	*Th*	8	1,43	0.54,22	0.11,47	0.42, 7
Tu	9	1,20	0. 9,93	0. 2,79	0. 7,1	*F*	9	1,65	0.55,87	0.11,78	0.44, 1
W	10	0,55	0.10,48	0. 3,10	0. 7,4	*Sa*	10	1,44	0.57,31	0.12,09	0.45, 2
Th	11	1,33	0.11,81	0. 3,41	0. 8,4	*Su*	11	2,38	0.59,69	0.12,40	0.47, 3
F	12	0,22	0.12,03	0. 3,72	0. 8,3	*M*	12	1,44	1. 1,13	0.12,71	0.48, 4
Sa	13	2,07	0.14,10	0. 4,03	0.10,1	*Tu*	13	1,24	1. 2,37	0.13,02	0.49, 3
Su	14	0,58	0.14,68	0. 4,34	0.10,3	*W*	14	1,26	1. 3,63	0.13,33	0.50, 3
M	15	1,54	0.16,22	0. 4,65	0.11,6	*Th*	15	1,31	1. 4,94	0.13,64	0.51, 3
Tu	16	1,38	0.17,60	0. 4,96	0.12,6	*F*	16	3,12	1. 8,06	0.13,95	0.54, 1
W	17	3,04	0.20,64	0. 5,27	0.15,4	*Sa*	17	2,87	1.10,93	0.14,26	0.56, 7
Th	18	0,83	0.21,47	0. 5,58	0.15,9	*Su*	18	2,82	1.13,75	0.14,57	0.59, 2
F	19	0,99	0.22,46	0. 5,89	0.16,6	*M*	19	1,91	1.15,66	0.14,88	1. 0, 8
Sa	20	1,37	0.23,83	0. 6,20	0.17,6	*Tu*	20	1,78	1.17,44	0.15,19	1. 2, 2
Su	21	1,70	0.25,53	0. 6,51	0.19,0	*W*	21	1,97	1.19,41	0.15,50	1. 3, 9
M	22	1,21	0.26,74	0. 6,82	0.19,9	*Th*	22	2,20	1.21,61	0.15,81	1. 5, 8
Tu	23	2,15	0.28,89	0. 7,13	0.20,8	*F*	23	1,28	1.22,89	0.16,12	1. 6, 8
W	24	Watch went down, having been				*Sa*	24	1,84	1.24,73	0.16,43	1. 8, 3
Th	25	forgot to be wound up.				*Su*	25	1,50	1.26,23	0.16,74	1. 9, 5
F	26	— 1,17	0.30,06	0. 7,44	0.22,6	*M*	26	2,09	1.28,32	0.17,05	1.11, 3
Sa	27	2,06	0.32,12	0. 7,75	0.24,4	*Tu*	27	2,23	1.30,55	0.17,36	1.13, 2
Su	28	2,10	0.34,22	0. 8,06	0.26,2	*W*	28	2,72	1.33,27	0.17,67	1.15, 6
M	29	1,99	0.36,21	0. 8,37	0.27,8	*Th*	29	1,33	1.34,60	0.17,98	1.16, 6
Tu	30	2,12	0.38,33	0. 8,68	0.29,6	*F*	30	1,84	1.36,44	0.18,29	1.18, 1
W	31	1,51	0.39,84	0. 8,99	0.30,8						

Day of the Month.			Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.
1779.			S.	M. S.	M. S.	M. S.
Sa	May	1	— 1,53	1.37,97	0.18,60	1.19, 4
Su		2	1,81	1.39,78	0.18,91	1.20, 9
M		3	1.17	1.40,95	0.19,22	1.21, 7
Tu		4	2,56	1.43.51	0.19,53	1.24, 0
W		5	2,12	1.45,63	0.19,84	1.25, 8
Th		6	0,53	1.46,16	0.20,15	1.26, 0
F		7	2,45	1.48,61	0.20,46	1.28, 1
Sa		8	1,33	1.49,94	0.20,77	1.29, 2
Su		9	0,84	1.50,78	0.21,08	1.29, 7
M		10	1,64	1.52,42	0.21,39	1.31, 0
Tu		11	1,69	1.54,11	0.21,70	1.32, 4
W		12	0,38	1.54,49	0.22,01	1.32, 5
Th		13	1,41	1.55,90	0.22,32	1.33, 6
F		14	0,19	1.56,09	0.22,63	1.33, 5
Sa		15	1,40	1.57,49	0.22,94	1.34, 5
Su		16	0,22	1.57,71	0.23,25	1.34, 5
M		17	1,08	1.58,79	0.23,56	1.35, 2
Tu		18	0,74	1.59,53	0.23,87	1.35, 7
W		19	0,54	2. 0,07	0.24,18	1.35,89
Th		20	0,83	2. 0,90	0.24,49	1.36,41
F		21	0,56	2. 1,46	0.24,80	1.36,66
Sa		22	1,80	2. 3,26	0.25,11	1.38, 1
Su		23	0,70	2. 3,96	0.25,42	1.38, 5
M		24	2,05	2. 6,01	0.25,73	1.40, 3
Tu		25	2,00	2. 8,01	0.26,04	1.42, 0
W		26	1,63	2. 9,64	0.26,35	1.43, 3
Th		27	1,68	2.11,32	0.26,66	1.44, 7
F		28	1,22	2.12,54	0.26,97	1.45, 6
Sa		29	1,94	2.14,48	0.27,28	1.47, 2
Su		30	2,31	2.16,79	0.27,59	1.49, 2
M		31	1,28	2.18,07	0.27,90	1.50, 2

Day of the Month.			Daily Error of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.
1779.			S.	M. S.	M. S.	M. S.
Tu	June	1	— 1,98	2.20,05	0,28,21	1.51, 8
W		2	2,08	2.22,13	0.28,52	1.53, 6
Th		3	2,32	2.24,45	0.28,83	1.55, 6
F		4	2,14	2.26,59	0.29,14	1.57, 4
Sa		5	1,64	2.28,23	0.29,45	1.58, 8
Su		6	1,70	2.29,93	0.29,76	2, 0, 2
M		7	2,39	2.32,32	0.30,07	2, 2, 2
Tu		8	2,16	2.34,48	0.30,38	2, 4, 1
W		9	2,16	2.36,64	0.30,69	2. 5, 9
Th		10	2,16	2.38,80	0.31,00	2. 7, 8
F		11	2,16	2.40,96	0.31,31	2. 9, 6
Sa		12	2,16	2.43,12	0.31,62	2.11, 5
Su		13	1,05	2.44,17	0.31,93	2.12, 2
M		14	1,50	2.45,67	0.32,24	2.13, 4
Tu		15	2,65	2.48,32	0.32,55	2.15, 8
W		16	1,02	2.49,34	0.32,86	2.16, 5
Th		17	1,69	2.51,03	0.33,17	2.17, 9
F		18	0,71	2.51,74	0.33,48	2.18, 3
Sa		19	0,96	2.52,70	0.33,79	2.18, 9
Su		20	0,19	2.52,89	0.34,10	2.18, 8
M		21	+ 0,11	2.52,78	0.34,41	2.18, 4
Tu		22	— 1,57	2.54,35	0.34,72	2.19, 6
W		23	1,57	2.55,92	0.35,03	2.20, 9
Th		24	1,57	2.57,49	0.35,34	2.22. 1
F		25	1,57	2.59,06	0.35,65	2.23, 4
Sa		26	1,57	3. 0,63	0.35,96	2.24, 7
Su		27	1,57	3. 2,20	0.36,27	2.25, 9
M		28	0,18	3. 2,38	0.36,58	2.25, 8
Tu		29	— 0,08	3. 2,30	0.36,89	2.25, 4
W		30	+ 0,10	3. 2,40	0.37,20	2.25, 2

THE following comparisons were made with a Regulator, the going of which was examined by a Transit Instrument, and the Errors of the Regulator accounted for, in the Rate of the Chronometer. When I have not been at Home to make Daily comparisons, the mean Rate of the Chronometer for that Interval, is inserted in the Register. Having Travelled with it some Thousands of Miles, on Horseback and in Carriages, I can with Truth assert, that neither the motion of the one, or the other, has ever, as far as I have been able to discover, altered the rate of THIS Chronometer. It is still going.

EDWARD EVERARD.

Lynn-Regis, April 12th, 1787.

DAILY RATE of the CHRONOMETER, No. 68, made by Mr. JOHN ARNOLD, and worn in the Pocket by Mr. EVERARD of LYNN.

1785.	Rate. S.	1786.	Rate. S.	1786.	Rate. S.	1786.	Rate. S.	1786	Rate. S.	1787.	Rate. S.
Nov. 11	+ 0,5	Jan. 14	+ 0,1	April 15	— 0,2	Sept. 10	+ 1,9	Dec. 19	+ 1,5	Feb. 22	+ 0,3
12	— 0,1	15	0,2	June 18	0,7	11	1,7	20	1,0	23	0,1
13	+ 0,6	16	0,8	19	+ 0,5	12	1,2	21	0,8	24	— 0,1
14	1,0	23	1,0	20	— 0,7	13	2,0	22	1,9	25	+ 1,0
15	1,0	24	0,2	21	0,4	14	2,2	23	0,2	26	1,4
16	— 0,2	25	0,4	22	0,6	15	2,4	24	0,0	27	1,2
17	+ 1,1	26	0,1	23	+ 0,6	16	1,8	25	0,5	28	0,4
18	2,2	27	— 1,2	24	— 0,4	17	1,3	26	0,7	Mar. 4	0,5
19	1,6	28	+ 0,5	25	0,4	18	2,1	28	1,3	5	0,9
20	1,4	Feb. 10	— 0,7	26	1,0	19	0,5	30	1,7	6	1,0
21	1,6	13	0,6	27	0,6	20	0,7	31	1,3	7	1,0
22	1,6	14	1,6	28	0,4	21	2,5	Jan. 1	1,0	8	1,3
23	2,7	15	0,4	30	0,4	22	0,3	2	1,4	9	0,7
24	0,9	16	0,3	July 1	0,5	23	1,5	3	0,6	10	— 0,3
25	0,4	17	0,3	2	0,1	24	0,9	4	— 0,8	11	0,3
26	0,2	18	0,9	3	+ 0,4	25	0,7	5	+ 1,4	12	+ 0,7
27	1,0	19	0,3	4	0,2	26	1,4	6	1,2	13	0,8
28	0,2	20	+ 0,1	5	— 0,1	27	0,8	7	1,0	14	— 0,3
29	— 0,8	21	— 0,9	6	+ 0,6	28	1,4	8	0,4	15	+ 0,6
30	+ 1,6	24	0,8	7	— 0,3	29	1,4	9	0,0	16	— 0,3
Dec. 1	— 0,3	25	0,8	8	+ 0,6	30	1,0	10	— 0,2	17	0,3
2	0,1	26	0,4	9	— 0,2	Oct. 1	1,1	11	+ 0,4	18	0,1
3	+ 0,1	27	0,2	10	0,2	2	2,2	12	— 0,6	19	+ 0,4
4	0,3	28	0,6	11	+ 0,6	3	2,0	13	+ 1,6	20	0,3

	3	+	0,1
	4		0,3
	5		0,1
	7	−	0,8
	8		0,7
	9		1,1
	10		0,7
	11		0,1
	12	+	0,1
	13		0,7
	14		0,2
	15		0,5
	16	−	0,6
	17		1,2
	18		0,8
	19		0,6
	20		0,0
	21		0,0
	22	+	0,2
	23		0,0
	24	−	0,2
	25		0,3
	26	+	0,1
	27		0,3
	28		1,5
	29		1,3
	30		0,2
	31		0,6
1786. Jan.	1		1,8
	2		1,0
	3		2,6
	4		0,4
	5		2,2
	6		0,8
	7		0,6
	8		0,2
	9	−	0,6
	10		0,2
	11	+	2,2
	12		1,6
	13		0,3

	27		0,2
	28		0,6
Mar.	1		0,6
	2		0,2
	3		0,0
	4		0,0
	5	+	0,6
	7		1,4
	8		1,0
	9		0,6
	10		0,8
	11	−	0,7
	12	+	0,7
	13		0,7
	14		0,0
	15		0,3
	16	−	0,3
	17	+	0,3
	18		0,2
	19		0,7
	20	−	0,6
	21		0,4
	22		0,0
	23		0,0
	24	+	0,6
	28	−	0,3
	29		0,1
	30		0,5
	31	+	0,1
April.	1		0,1
	2	−	0,7
	4		0,8
	5		0,7
	6		0,9
	8		0,0
	9	+	0,9
	10		1,0
	11		0,4
	12	−	0,4
	13		1,0
	14		1,4

	10		0,2
	11	+	0,6
	12	−	0,3
	13	+	0,1
	14		0,5
	15		0,3
	16		0,1
	17	−	0,4
	18		0,2
	19		0,3
	20	+	0,9
	21		1,6
	22		0,2
	23		0,2
	24		1,5
Aug.	4	−	0,4
	5	+	1,3
	6	−	0,0
	7		0,0
	8	+	0,8
	9		1,4
	10		0,2
	17		1,3
	18		0,6
	19		0,8
	20		0,4
	21		0,6
	22		0,8
	28	−	0,2
	29	+	2,7
	30		2,5
	31		1,3
Sept.	1		1,8
	2		1,0
	3		1,6
	4		1,1
	5		1,6
	6		2,3
	7		1,3
	8		1,7
	9		1,9

	2		2,2
	3		2,0
	4		1,3
	5		1,6
	6		1,1
	7		1,2
	8		1,6
	9		1,7
	10		2,4
	11		2,1
	12		1,1
	13		1,1
	14		1,1
	15		0,7
	16		0,7
	17		1,3
	18		1,5
	19		1,9
	20		1,9
	21		1,3
	22		1,3
	23		0,9
	24		1,5
Nov.	2		0,5
	3		1,5
	5		0,6
	6		0,9
	7		0,9
	8		1,0
	9		1,2
	10		1,2
	11		0,9
	12		1,2
	13		1,9
	14		1,0
Dec.	13		1,2
	14		1,3
	15		2,3
	16		1,1
	17		1,5
	18		0,9

	12	−	0,6
	13	+	1,6
	14		0,6
	15		0,6
	16		2,1
	17		1,0
	18		0,4
	19		1,4
	20		1,7
	21		1,2
	22		1,4
	23		1,3
	24		1,7
	25		0,5
	26		1,1
	27		0,5
	28		0,7
	29		1,1
	30		2,3
	31		2,2
Feb.	1		0,6
	2		1,4
	3		2,4
	4		1,6
	5		1,7
	6		1,3
	7	−	0,7
	8	+	2,1
	9		0,5
	10		1,5
	11		1,4
	12		1,9
	13		2,2
	14		1,2
	15		1,8
	16		2,0
	17		2,2
	18		1,4
	19		0,9
	20		0,8
	21		0,9

	19	+	0,4
	20		0,2
	21	−	0,6
	22		0,9
	23	+	0,7
	24	−	0,1
	25	+	0,1
	26		0,9
	27		0,8
	28		0,2
	29		0,0
	30	−	0,4
	31		0,2
April	1		0,0
	2		0,6
	3		1,6
	4		0,4
	5		0,6
	6		0,8
	7	+	1,4
	8	−	1,0
	9		0,7
	10		1,1
	11		0,9
	12		0,6
	13		0,4
	14		0,6
	15		0,6
	16	+	0,1
	17		0,7
	18		0,6
	19		0,8
	20		0,9
	21		0,1

Day of the Month.		Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.	Day of the Month.		Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.
1779.		S.	M. S.	M. S.	M. S.	1779.		S.	M. S.	M. S.	M. S.
Th	July 1	— 0,54	3. 2,94	0.37,51	2.25, 4	*Su*	Auguſt 1	— 0,50	3.12,72	0.47,12	2.25, 6
F . . .	2	+ 0,31	3. 2,63	0.37,82	2.24, 8	*M* . . .	2	0,59	3.13,31	0.47,43	2.25, 9
Sa . . .	3	0,23	3. 2,40	0.38,13	2.24, 3	*Tu* . . .	3	0,39	3.13,70	0.47,74	2.26, 0
Su . . .	4	— 0,44	3. 2,84	0.38,44	2.24, 4	*W* . . .	4	+ 0,42	3.13,28	0.48,05	2.25, 2
M . . .	5	0,03	3. 2,87	0.38,75	2.24, 1	*Th* . . .	5	0,03	3.13,25	0.48,36	2.24, 9
Tu . . .	6	0,65	3. 3.52	0.39,06	2.24, 5	*F* . . .	6	— 1,04	3.14,29	0.48,67	2.25, 6
W . . .	7	+ 1,33	3. 2,19	0.39,37	2.22, 8	*Sa* . . .	7	0,56	3.14,85	0.48,98	2.25, 9
Th . . .	8	0,91	3. 1,28	0.39,68	2.21, 6	*Su* . . .	8	1,35	3.16,10	0.49,29	2.26, 8
F . . .	9	0,16	3. 1,12	0.39,99	2.21, 1	*M* . . .	9	1,70	3.17,80	0.49,60	2.28, 2
Sa . . .	10	— 0,12	3. 1,24	0.40,30	2.20, 9	*Tu* . . .	10	1,22	3.19,02	0.49,91	2.29, 1
Su . . .	11	0,34	3. 1,58	0.40,61	2.21, 0	*W* . . .	11	0,73	3.19,75	0.50,22	2.29, 5
M . . .	12	0,69	3. 2,27	0.40,92	2.21, 3	*Th* . . .	12	0,46	3.20,21	0.50,53	2.29, 7
Tu . . .	13	0,46	3. 2,73	0.41,23	2.21, 5	*F* . . .	13	0,44	3.20,65	0.50,84	2.29, 8
W . . .	14	1,52	3. 4,25	0.41,54	2.22, 7	*Sa* . . .	14	0,47	3.21,12	0.51,15	2.30, 0
Th . . .	15	1,03	3. 5,28	0.41,85	2.23, 4	*Su* . . .	15	+ 0,02	3.21,10	0.51,46	2.29, 6
F . . .	16	+ 0,16	3. 5,12	0.42,16	2.23, 0	*M* . . .	16	— 0,31	3.21,41	0.51,77	2.29, 6
Sa . . .	17	— 0,78	3. 5,90	0.42,47	2.22, 4	*Tu* . . .	17	0,33	3.21,74	0.52,08	2.29, 7
Su . . .	18	1,84	3. 7,74	0.42,78	2.25, 0	*W* . . .	18	1,13	3.22,87	0.52,39	2.30, 5
M . . .	19	0,79	3. 8,53	0.43,09	2.25, 4	*Th* . . .	19	0,19	3.23,06	0.52,70	2.30, 4
Tu . . .	20	1,33	3. 9,86	0.43,40	2.26, 5	*F* . . .	20	+ 0,32	3.22,74	0.53,01	2.29, 7
W . . .	21	0,74	3.10,60	0.43,71	2.26, 9	*Sa* . . .	21	0,43	3.22,31	0.53,32	2.29. 0
Th . . .	22	0,71	3.11,31	0.44,02	2.27, 3	*Su* . . .	22	— 0,33	3.22,64	0.53,63	2.29, 0
F . . .	23	0,91	3.12,22	0.44,33	2.27, 9	*M* . . .	23	1,18	3.22,82	0.53,94	2.29, 9
Sa . . .	24	0,38	3.12,60	0.44,64	2.28, 0	*Tu* . . .	24	0,29	3.24,11	0.54,25	2.29, 9
Su . . .	25	+ 0,30	3.12,30	0.44,95	2.27, 3	*W* . . .	25	0,33	3.24,44	0.54,56	2.29, 9
M . . .	26	0,20	3.12,10	0.45.26	2.26, 8	*Th* . . .	26	+ 0,05	3.24,39	0.54,87	2.29, 5
Tu . . .	27	— 0,01	3.12,11	0.45,57	2.26, 5	*F* . . .	27	— 0,34	3.24,83	0.55,18	2.29, 6
W . . .	28	+ 0,10	3.12,01	0.45,88	2.26, 1	*Sa* . . .	28	1,38	3.26,21	0.55,49	2.30, 7
Th . . .	29	— 0,38	3.12,39	0.46,19	2.26, 2	*Su* . . .	29	1,05	3.27,26	0.55,80	2.31, 5
F . . .	30	+ 0,58	3.11,81	0.46,50	2.25, 3	*M* . . .	30	1,00	3.28,26	0.56,11	2.32, 1
Sa . . .	31	— 0,41	3.12,22	0.46,81	2.25, 4	*Tu* . . .	31	0,97	3.29,23	0.56,42	2.32, 8

Day of the Month.		Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.
1779.		S.	M. S.	M. S.	M. S.
W	September 1	— 0,31	3.29,54	0.56,73	2.32, 8
Th	2	0,71	3.30,25	0.57,04	2.33, 2
F	3	0,33	3.30,58	0.57,35	2.33, 2
Sa	4	+ 1,14	3.29,44	0.57,66	2.31, 8
Su	5	0,15	3.29,29	0.57,97	2.31, 3
M	6	0,41	3.28,88	0.58,28	2.30, 6
Tu	7	— 0,66	3.29,54	0.58,59	2.30, 9
W	8	+ 1,34	3.28,20	0.58,90	2.29, 3
Th	9	0,75	3,27,45	0.59,21	2.28, 2
F	10	2,18	3.25,27	0.59,52	2.25, 7
Sa	11	0,18	3.25,11	0.59,83	2.25, 3
Su	12	1,54	3.23,57	1. 0,14	2.23, 4
M	13	— 0,14	3.23,71	1. 0,45	2.23, 3
Tu	14	+ 1,12	3.22,59	1. 0,76	2.21, 8
W	15	— 1,36	3.23,95	1. 1,07	2.22, 9
Th	16	+ 1,23	3.22,72	1. 1,38	2.21, 3
F	17	1,32	3.21,40	1. 1,69	2.19, 7
Sa	18	— 0,13	3.21,53	1. 2,00	2.19, 5
Su	19	+ 0,64	3.20,89	1. 2,31	2.18, 6
M	20	1,91	3.18,98	1. 2,62	2.16, 4
Tu	21	1,53	3.17,45	1. 2,93	2.14, 5
W	22	1,29	3.16,16	1. 3,24	2.12, 9
Th	23	0,02	3.16,14	1. 3,55	2.12, 6
F	24	0,02	3.16,12	1. 3,86	2.12, 3
Sa	25	1,18	3.14,94	1. 4,17	2.10, 8
Su	26	— 0,71	3.15,65	1. 4,48	2.11, 2
M	27	1,31	3.16,96	1. 4,79	2.12, 2
Tu	28	+ 0,18	3.16,78	1. 5,10	2.11, 7
W	29	0,51	3.16,27	1. 5,41	2.10, 9
Th	30	0,36	3.15,91	1. 5,72	2.10, 2

Day of the Month.		Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.
1779.		S.	M. S.	M. S.	M. S.
F	October 1	+ 0,70	3.15,21	1. 6,03	2. 9, 2
Sa	2	1,02	3.14,19	1. 6,34	2. 7, 8
Su	3	1,53	3.12,66	1. 6,65	2. 6, 0
M	4	1,18	3.11,48	1. 6,96	2. 4, 5
Tu	5	0,69	3.10,79	1. 7,27	2. 3, 5
W	6	0,85	3. 9,94	1. 7,58	2. 2, 4
Th	7	1,64	3. 8,30	1. 7,89	2. 0, 4
F	8	2,74	3. 5,56	1. 8,20	1.57, 4
Sa	9	0,20	3. 5,36	1. 8,51	1.56, 8
Su	10	— 0,67	3. 6,03	1. 8,82	1.57, 2
M	11	0,94	3. 6,97	1. 9,13	1.57, 8
Tu	12	2,82	3. 9,79	1. 9,44	2. 0, 3
W	13	+ 0,07	3. 9,72	1. 9,75	2. 0, 0
Th	14	— 0,99	3.10,71	1.10,06	2. 0, 6
F	15	+ 0,36	3.10,35	1.10,37	2. 0, 0
Sa	16	— 0,33	3.10,68	1.10,68	2. 0, 0
Su	17	0,29	3.10,97	1.10,99	2. 0, 0
M	18	0,41	3.11,38	1.11,30	2. 0, 1
Tu	19	+ 1,24	3.10,14	1.11,61	1.58, 5
W	20	1,63	3. 8,51	1.11,92	1.56, 6
Th	21	0,25	3. 8,26	1.12,23	1.56, 0
F	22	— 2,13	3.10,39	1.12,54	1.57, 8
Sa	23	+ 0,94	3. 9,45	1.12,85	1.56, 6
Su	24	1,15	3. 8,30	1.13,16	1.55, 1
M	25	1,20	3. 7,10	1.13,47	1.53, 6
Tu	26	0,46	3. 6,64	1.13,78	1.52, 9
W	27	1,77	3. 4,87	1.14,09	1.50, 8
Th	28	0,37	3. 4.50	1.14,40	1.50, 1
F	29	— 0,27	3. 4,77	1.14,71	1.50, 1
Sa	30	+ 0,51	3. 4,26	1.15,02	1.49, 2
Su	31	0,25	3. 4,01	1.15,33	1.48, 7

Day of the Month.		Daily Rate of the Chronometer.	Total Loſs of ditto.	Computed Loſs of ditto.	Error of Chronometer.	Day of the Month.		Daily Rate of the Chronometer.	Total Loſs of ditto.	Computed Loſs of ditto.	Error of Chronometer.
1780.		S.	M. S.	M. S.	M. S.	1780.		S.	M. S.	M. S.	M. S.
Sa	January 1	— 2,13	3.20,28	1.35,55	1.45, 7	*Tu*	February 1	— 1,35	3.40,64	1.44,16	1.56, 5
Su	2	1,41	3.21,69	1.34,86	1.46, 8	*W*	2	2,47	3.43,11	1.44,47	1.58, 6
M	3	0,14	3.21,83	1.35,17	1.46, 7	*Th*	3	2,47	3.45,58	1.44,78	2. 0, 8
Tu	4	0,04	3.21,87	1.35,48	1.46, 4	*F*	4	1,53	3.47,11	1.45,09	2. 2, 0
W	5	1,09	3.22,96	1.35,79	1.47, 2	*Sa*	5	0,38	3.47,49	1.45,40	2. 2, 1
Th	6	+ 0,15	3.23,11	1.36,10	1.47, 0	*Su*	6	1,03	3.48,52	1.45,71	2. 2, 8
F	7	— 0,49	3.23,60	1.36,41	1.47, 2	*M*	7	0,47	3.48,99	1.46,02	2. 3, 0
Sa	8	0,39	3.23,99	1.36,72	1.47, 3	*Tu*	8	0,68	3.49,67	1.46,33	2. 3, 3
Su	9	0,32	3.24,31	1.37,03	1.47, 3	*W*	9	0,06	3.49,73	1.46,64	2. 3, 1
M	10	0,94	3.25,25	1.37,34	1.47, 9	*Th*	10	0,06	3.49,79	1.46,95	2. 2, 8
Tu	11	2,95	3.28,20	1.37,65	1.50, 5	*F*	11	0,06	3.49,85	1.47,26	2. 2, 6
W	12	0,43	3.28,63	1.37,96	1.50, 7	*Sa*	12	0,80	3.50,65	1.47,57	2. 3, 1
Th	13	0,78	3.29,41	1.38,27	1.51, 1	*Su*	13	1,44	3.52,09	1.47,88	2. 4, 2
F	14	0,53	3.29,94	1.38,58	1.51, 4	*M*	14	+ 2,28	3.49,81	1.48,19	2. 1, 6
Sa	15	+ 0,24	3.29,70	1.38,89	1.50, 8	*Tu*	15	0,49	3.49,32	1.48,50	2. 0, 8
Su	16	0,24	3.29,46	1.39,20	1.50, 3	*W*	16	— 1,77	3.51,09	1.48,81	2. 2, 3
M	17	0,24	3.29,22	1.39,51	1.49, 7	*Th*	17	1,17	3.52,26	1.49,12	2. 3, 1
Tu	18	— 0,82	3.30,04	1.39,82	1.50, 2	*F*	18	1,51	3.53,77	1.49,43	2. 4, 3
W	19	0,73	3.30,77	1.40,13	1.50, 6	*Sa*	19	0,56	3.54,33	1.49,74	2. 4, 6
Th	20	0,32	3.31,09	1.40,44	1.50, 6	*Su*	20	0,30	3.54,63	1.50,05	2. 4, 6
F	21	+ 0,43	3.30,66	1.40,75	1.49, 9	*M*	21	0,92	3.55,55	1.50,36	2. 5, 2
Sa	22	— 0,55	3.31,21	1.41,06	1.50, 0	*Tu*	22	0,36	3.55,91	1.50,67	2. 5, 2
Su	23	+ 0,20	3.31,01	1.41,37	1.49, 6	*W*	23	0,62	3.56,53	1.50,98	2. 5, 5
M	24	— 0,48	3.31,49	1.41,68	1.49, 8	*Th*	24	1,13	3.57,66	1.51,29	2. 6, 4
Tu	25	1,18	3.32,67	1.41,99	1.50, 7	*F*	25	0,54	3.58,20	1.51,60	2. 6, 6
W	26	0,68	3.33,35	1.42,30	1.51, 0	*Sa*	26	+ 0,81	3.57,39	1.51,91	2. 5, 5
Th	27	1,77	3.35,12	1.42,61	1.52, 5	*Su*	27	— 0,41	3.57,80	1.52,22	2. 5, 6
F	28	0,43	3.35,55	1.42,92	1.52, 6	*M*	28	+ 0,80	3.57,00	1.52,53	2. 4, 5
Sa	29	1,39	3.36,94	1.43,23	1.53, 7	*Tu*	29	0,26	3.56,74	1.52,84	2. 3, 9
Su	30	1,74	3.38,68	1.43,54	1.55, 1						
M	31	0,61	3.39,29	1.43,85	[illegible]						

Day of the Month.	Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.	Day of the Month.	Daily Rate of the Chronometer.	Total Loss of ditto.	Computed Loss of ditto.	Error of Chronometer.
1779.	S.	M. S.	M. S.	M. S.	1779.	S.	M. S.	M. S.	M. S.
M November 1	+ 0,86	3. 3,15	1.15,64	1.47, 5	*W* December 1	— 0,17	3. 2,79	1.24,94	1.37, 8
Tu . . . 2	0,02	3. 3,13	1.15,95	1.47, 2	*Th* . . . 2	+ 0,67	3. 2,12	1.25,25	1.36, 9
W . . . 3	0,68	3. 2,45	1.16,26	1.46, 2	*F* 3	0,19	3. 1,93	1.25,56	1.36, 4
Th . . . 4	1,16	3. 1,29	1.16,57	1.44, 7	*Sa* . . . 4	0,43	3. 1,50	1.25,87	1.35, 6
F 5	0,45	3. 0,84	1.16,88	1.44, 0	*Su* . . . 5	0,09	3. 1,41	1.26,18	1.35, 2
Sa . . . 6	0,26	3. 0,58	1.17,19	1.43, 4	*M* . . . 6	0,50	3. 0,91	1.26,49	1.34, 4
Su . . . 7	— 0,21	3. 0,79	1.17,50	1.43, 3	*Tu* . . . 7	0,78	3. 0,13	1.26,80	1.33, 3
M . . . 8	+ 1,88	2.58,91	1.17,81	1.41, 1	*W* . . . 8	— 0,60	3. 0,73	1.27,11	1.33, 6
Tu . . . 9	— 1,00	2.59,91	1.18,12	1.41, 8	*Th* . . . 9	3,12	3. 3,85	1.27,42	1.36, 4
W . . . 10	2,64	3. 2,55	1.18,43	1.44, 1	*F* . . . 10	0,81	3. 4,66	1.27,73	1.36, 9
Th . . . 11	0,60	3. 3,15	1.18,74	1.44, 4	*Sa* . . . 11	0,68	3. 5,34	1.28,04	1.37, 3
F . . . 12	+ 1,67	3. 1,48	1.19,05	1.42, 4	*Su* . . . 12	0,33	3. 5,67	1.28,35	1.37, 3
Sa . . . 13	0,40	3. 1,08	1.19,36	1.41, 7	*M* . . . 13	0,06	3. 5,73	1.28,66	1.37, 1
Su . . . 14	— 0,12	3. 1,20	1.19,67	1.41, 5	*Tu* . . . 14	1,64	3. 7,37	1.28,97	1.38, 4
M . . . 15	0,45	3. 1,65	1,19,98	1.41, 7	*W* . . . 15	+ 0,07	3. 7,30	1.29,28	1.38, 0
Tu . . . 16	+ 0,23	3. 1,42	1.20,29	1.41, 1	*Th* . . . 16	— 1,32	3. 8,62	1.29,59	1.39, 0
W . . . 17	— 0,26	3. 1,68	1.20,60	1.41, 1	*F* . . . 17	0,27	3. 8,89	1.29,90	1.39, 0
Th . . . 18	+ 1,15	3. 0,53	1.20,91	1.39, 6	*Sa* . . . 18	0,96	3. 9,85	1.30,21	1.39, 6
F . . . 19	0,78	2.59,75	1.21,22	1.38, 5	*Su* . . . 19	1,03	3.10,88	1.30,52	1.40, 4
Sa . . . 20	1,14	2.58,61	1.21,53	1.37, 1	*M* . . . 20	0,30	3.11,18	1.30,83	1.40, 3
Su . . . 21	— 0,77	2.59,38	1.21,84	1.37, 5	*Tu* . . . 21	+ 0,41	3.10,77	1.31,14	1.39, 6
M . . . 22	+ 0,12	2.59,26	1.22,15	1.37, 1	*W* . . . 22	— 0,46	3.11,23	1.31,45	1.39, 8
Tu . . . 23	0,11	2.59,15	1.22,46	1.36, 7	*Th* . . . 23	+ 0,96	3.10,27	1.31,76	1.38, 5
W . . . 24	— 0,94	3. 0,09	1.22,77	1.37, 3	*F* . . . 24	— 1,01	3.11,28	1.32,07	1.39, 2
Th . . . 25	0,56	3. 0,65	1.23,08	1.37, 6	*Sa* . . . 25	1,32	3.12,60	1.32,38	1.40, 2
F . . . 26	0,37	3. 1,02	1.23,39	1.37, 6	*Su* . . . 26	3,95	3.16,55	1.32,69	1.43, 9
Sa . . . 27	1,02	3. 2,04	1.23,70	1.38, 3	*M* . . . 27	+ 0,16	3.16,39	1.33,00	1.43, 4
Su . . . 28	+ 0,35	3. 1,69	1.24,01	1.37, 7	*Tu* . . . 28	— 0,50	3.16,89	1.33,31	1.43, 6
M . . . 29	— 0,44	3. 2,13	1.24,32	1.37, 8	*W* . . . 29	0,40	3.17,29	1.33,62	1.43, 7
Tu . . . 30	0,49	3. 2,62	1.24,63	1.38, 0	*Th* . . . 30	1,51	3.18,80	1.33,93	1,44, 9
					F . . . 31	+ 0,65	3.18,15	1.34,24	1.43, 9

A New Formula for LONGITUDE, having the Linear Tables, &c. By S. DUNN.

N.B. Co. is Rem.r to 90°. Supp.t is Rem.r to 180°. Co-ar. is Co-secant less Index 10. Sine, Tangent, Secant or Co-ar. of Degrees more than 90° is that of Supp.t Subtract if not to add
Solar Time is used for the Longitude in Hours & Degrees. Mean Solar Time is that which Clocks & Watches are made to keep nearly at Sea & on Land.

Distance Limbs =	Rough Hour at Greenw.	1.st Hours =	Ditto =
● Semidiam.r =	● Altitude =	2.d Hours =	P =
☽ Semidiam.r =	☽ Altitude =	Diff.ce = f	Diff.ce = s
For ☽ Altitude =	☽ Hor. Par. =		
Distance Centres L	Co-ar. =		Prop.r Log. s =
For ● & ☽ Alt.	in Table I. = 2.		Prop.r Log. f =
	Common Log.m = A =	=	in Tab. Prop.r Log.s =
	in Table II = B =	=	1.st Hours add in Degrees or Hours.
add to Dist. Centres =	= Correction for Refrac.n =	=	Time at Greenw. past Noon.

D. =	Sine =	Co-latitude =	Co-ar.
● Altitude =	Co-Secant =	Polar-dist. =	Co-ar. =
☽ Hor. Par. =	Proper Log.m =	● Co-alt =	=
First Arc =	Proper Log.m =	2)	=
D. =	Tangent =	Half-sum =	Sine =
☽ Altitude =	Co-secant =	Remaind.r =	Sine =
☽ Hor. Par. =	Proper Log.m =		2)
Second Arc =	Proper Log.m =	Solar Time at per Watch.	= Co-sine =
Corr.n for Par.x C. =	Add the Arcs together if D. exceeds 90°		= Time at Ship
D. =			= Longitude from Greenwich.

Add C. to D. only when the first Arc is the least of the two & at same time D. is less than 90°.

E. =
F. = add.r if E. is under 90°
P. = True Distance

Dip.	
Feet.	
1	= 1′
4	= 2′
8	= 3′
14	= 4′
22	= 5′
32	= 6′
43	= 7′
55	= 8′

Alt.		Ref.n	Alt.		Ref.n
42°	=	1′	5°	=	9′
24	=	2′	5 4	=	10′
17	=	3′	4 4	=	11′
13	=	4′	4	=	12′
11	=	5′	3 4	=	13′
9	=	6′	3 3	=	14′
7 6	=	7′	3	=	15′
			3	=	16′

☽ Alt.		Increase of Semr.
10°	=	3′
20	=	3 3
30	=	8′
40	=	10′
58	=	12′
60	=	14′
80	=	16″
90	=	17

Hours.		Degrees.
3	=	45°
6	=	90
9	=	135
12	=	180
15	=	225
18	=	270
21	=	315
24	=	360

Month	Day	⊙ on the Merid.n	Each to the nearest Half Minute.
Jan.r	1 =	18′ 4″	
	8 =	7′	
	15 =	10′	
	22 =	12′	
Feb.r	1 =	14′	
	8 =	15′	
	15 =	15′	
	22 =	14′	
Mar.r	1 =	12′ 5″	
	8 =	11′	
	15 =	9′	
	22 =	7′	
Apr.r	1 =	4′	
	8 =	2′	
	15 =	0′	
	22 =	57′ 59″	
May	1 =	57′	
	8 =	56′	
	15 =	56′	
	22 =	56′	
Jun.e	1 =	57′	
	8 =	59′	
	15 =	2′ 0″	
	22 =	2′	
Jul.y	1 =	3′	
	8 =	5′	
	15 =	5′ 5″	
	22 =	6′	
Aug.t	1 =	6′	
	8 =	5′	
	15 =	4′	
	22 =	2′	
Sep.r	1 =	0′ 59″	
	8 =	57′	
	15 =	55′	
	22 =	52′ 54″	
Oct.r	1 =	49′ 4″	
	8 =	47′ 8″	
	15 =	46′	
	22 =	44′ 4″	
Nov.r	1 =	44′	
	8 =	44′	
	15 =	45′	
	22 =	47′	
Dec.r	1 =	50′	
	8 =	53′	
	15 =	56′	
	22 =	59′ 4″	

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A Short Formula for LONGITUDE, having the Linear Tables, &c. By S. DUNN.

2

Distance Limbs = ° ' "
☉ Semidiam^{r} = . .
☽ Semidiam^{r} = . .
For ☽ Altitude = . .

1

Rough Hour at Greenw.
☉ Altitude = ° ' "
☽ Altitude = . .
☽ Hor Par = . .

5

1st Hours = ° ' "
2^{d} Hours = . .
Diff. f = . .

Ditto = . .
P = . .
Diff.^{ce} f = . .
Prop^{r} Log. f = .
Prop^{r} Log. f = .

Distance Centres L. = ° ' "
For ☉ & ☽ Alt = . .

Co-ar = .
in Table I = 2.

Common Log^{m} = A = "
in Table II = B = "

Side of P.L. a 4th add = Minutes.
Bottom P.L. = . . in Tab Prop Log^{s} = .
1st Hours add in Degrees.
H ' "
. . Time at Greenw. past Noon.

add to Dist Centres = ° ' " = Correction for Refrac^{n} = .

3

D. = ° ' " Sine = .
☉ Altitude = . . Co-Secant = .
☽ Hor. Par = . . Proper Log^{m} = .

First Arc = ° ' " Proper Log^{m} = .

D. = . . Tangent = .
☽ Altitude = . . Co-secant = .
☽ Hor. Par = . . Proper Log^{m} = .

Second Arc = ° ' " Proper Log^{m} = .

4

Corr^{n} for Par^{x} C. = ° ' " Add the Arcs together if D. exceeds 90°.
D. = . .
Add C to D. only when the first Arc is the least of the two & at same time D. is less than 90°
E. = .
F. = . . add^{n} E. is under 90°.

P. = ° ' " True Distance of Centres.

6

° '
Co-latitude = . . Co-ar.
Polar-dist. = . . Co-ar.
☉ Co-alt. = . . =
2) . . =
Half sum = . . Sine =
Remaind^{r} = ° ' Sine =

Solar Time at per Watch. H ' " A = ° ' Co-sine =
H ' " ° ' Time at Ship
Longitude from Greenwich.

3^{H} =	45°
6. =	90.
9. =	135.
12. =	180.

In this Formula when not to add, subtract.

15^{H}. =	225°
18. =	270.
21. =	315.
24. =	360.

Published according to Act of Parliament October 24. 1783. by Samuel Dunn, Boar's head Court, Fleet street, LONDON.

S. Dunn inv.^{t} et delin^{r}.

A Table of REFRACTION in ALTITUDE, by S. Dunn, Teacher of Mathematics LONDON.

Alt.d	Refrac.n	Alt.d	Refrac.n	Alt.d	Refrac.n	Alt.d	Refrac.n	Alt.d	Refrac.n	Alt.d	Refrac.n	Alt.d	Refrac.n	Alt.d	Refrac.n
o ′	′ ″	o ′	o ′	o ′	′ ″	o ′	′ ″	o ′	′ ″	o ′	′ ″	o ′	′ ″	o ′	′ ″
. 0	34.27	30.	28.57	1. 0	24.32	3. 0	14.28	5. 0	9.40	8.	6.24	37.	1.12	66.	.25
. 1	34.15	31.	28.47	. 4	24. 3	. 4	14.12	. 6	9.28	9.	5.43	38.	1. 9	67.	.23
. 2	34. 3	32.	28.37	. 8	23.35	. 8	13.56	.12	9.16	10.	5.10	39.	1. 7	68.	.22
. 3	33.51	33.	28.28	.12	23. 8	.12	13.44	.18	9. 4	11.	4.43	40.	1. 5	69.	.21
. 4	33.39	34.	28.18	.16	22.42	.16	13.32	.24	8.56	12.	4.19	41.	1. 2	70.	.20
. 5	33.27	35.	28. 9	.20	22.17	.20	13.20	.30	8.51	13.	3.58	42.	1. 0	71.	.19
. 6	33.15	36.	27.59	.24	21.52	.24	13. 8	.36	8.45	14.	3.40	43.	.58	72.	.18
. 7	33. 3	37.	27.49	.28	21.28	.28	12.56	.42	8.39	15.	3.24	44.	.56	73.	.17
. 8	32.51	38.	27.40	.32	21. 4	.32	12.44	.48	8.33	16.	3. 9	45.	.54	74.	.16
. 9	32.40	39.	27.31	.36	20.40	.36	12.32	.54	8.27	17.	2.56	46.	.52	75.	.15
.10	32.29	.40	27.23	.40	20.16	.40	12.20	6. 0	8.21	18.	2.45	47.	.51	76.	.14
.11	32.17	.41	27.13	.44	19.52	.44	12.12	. 6	8.10	19.	2.35	48.	.49	77.	.13
.12	32. 6	.42	27. 4	.48	19.31	.48	12. 4	.12	8. 4	20.	2.26	49.	.47	78.	.12
.13	31.55	.43	26.55	.52	19.11	.52	11.56	.18	7.58	21.	2.18	50.	.46	79.	.11
.14	31.44	.44	26.46	.56	18.51	.56	11.48	.24	7.52	22.	2.11	51.	.44	80.	.10
.15	31.33	.45	26.37	2. 0	18.31	4. 0	11.40	.30	7.46	23.	2. 5	52.	.42	81.	. 9
.16	31.22	.46	26.28	. 4	18.15	. 4	11.32	.36	7.39	24.	2. 0	53.	.41	82.	. 8
.17	31.11	.47	26.19	. 8	17.56	. 8	11.24	.42	7.33	25.	1.55	54.	.39	83.	. 7
.18	31. 0	.48	26.10	.12	17.36	.12	11.16	.48	7.27	26.	1.50	55.	.38	84.	. 6
.19	30.49	.49	26. 2	.16	17.16	.16	11. 8	.54	7.21	27.	1.46	56.	.37	85.	. 5
.20	30.39	.50	25.54	.20	16.57	.20	11. 0	7. 0	7.15	28.	1.41	57.	.35	86.	. 4
.21	30.29	.51	25.45	.24	16.39	.24	10.52	. 6	7. 9	29.	1.37	58.	.34	87.	. 3
.22	30.18	.52	25.36	.28	16.21	.28	10.44	.12	7. 3	30.	1.33	59.	.33	88.	. 2
.23	30. 8	.53	25.27	.32	16. 3	.32	10.36	.18	6.57	31.	1.29	60.	.31	89.	. 1
.24	29.57	.54	25.18	.36	15.47	.36	10.28	.24	6.51	32.	1.26	61.	.30	90.	. 0
.25	29.47	.55	25.10	.40	15.31	.40	10.20	.30	6.45	33.	1.23	62.	.29		
.26	29.37	.56	25. 2	.44	15.25	.44	10.12	.36	6.39	34.	1.20	63.	.28		
.27	29.27	.57	24.54	.48	15. 9	.48	10. 4	.42	6.33	35.	1.17	64.	.27		
.28	29.17	.58	24.46	.52	14.53	.52	9.56	.48	6.27	36.	1.14	65.	.26		
.29	29. 7	.59	24.39	.56	14.40	.56	9.48	.54	6.24						

Diff.ce of Refraction for each Minute of Altitude 11″.

Diff.ce of Refraction for each Minute of Altitude 9″.

Diff.ce of Refrac.n for 4′ Altitude 25″.

Diff.ce of Refrac.n for 4′ Altitude 18″.

Diff.ce of Refrac.n for 4′ Altitude 12″.

Diff.ce of Refrac.n for 4′ Altitude 10″.

For 6′ Alt. 14″.

For 6′ Alt. 8″.

Here the Differences of Refraction are for 6″ Altitude.

Here the Differences of Refraction are for 6′ Altitude.

Here the Differences of Refraction are for 60″ Altitude.

Here the Differences of Refraction are for 60′ Altitude.

* Between N° 63 & 66 Fleet street.

Removed from Clements Inn and from Maulev Lane.

Published according to Act of Parliament July 14th 1780, by S. Dunn N° 1. Boars-head Court Fleet street.

A New FORMULA for LATITUDE having Sights of Sun & Moon; By S. Dunn.

l = Latitude by Reckoning		O = Co-latitude	Co ar.
d = Decl.^{n} ☉ or ☽ far à Merid.^{n}		p = Polar dist	Co ar.
n = Alt. ☉ or ☽ far à Merid.^{n}		a = Co-alt	
F = Decl. ☽ or ☉ near Merid.^{n}		sum 2	
B = Comp.^{t} ☽ or ☉ Declination		½ Sum	Sine
P = Polar dist. ☽ or ☉ near Merid.^{n}		Rem.^{r}	Sine
N = Altitude ☽ or ☉ near Merid.^{n}			Cosine
b = Co-alt. ☽ or ☉ near Merid.^{n}		2	
R.^{t} Asc.^{n} ☉ or ☽ far à Merid.^{n}		t =	
R.^{t} Asc ☽ or ☉ near Merid.^{n}		Q =	
Q = ☉ & ☽ Equator.^{l} distance		T =	Sine
Preparations.		F =	Cosine
Obs.^{d} Alt. ☉ lower Limb		G =	Sine
Semid.^{r} ′ Dip ′ Ref.^{n} ′ is		F =	Sine
True Alt. ☉ Centre		G =	Secant
Obs.^{d} Alt. ☽ lower or upper Limb.		A =	Cosine
Semid.^{r} ′ Dip ′ Ref.^{n} ′ is		N =	Sine
: Cosine M=	″	G =	Secant
: ☽ Hor. Par.^{x} =		D =	Cosine
: ☽ Par.^{x} Alt.^{d} add			
Obs.^{d} Alt. ☽ Centre M=		A =	
True Alt. ☽ Centre		B =	
☽ true Declination		C =	add if P is under 90°, else sub.
☽ true Polar dist.		D =	
☉ true Right Ascension		E =	☽ or ☉ Zenith dist.
☽ true Right Ascension		F =	☽ or ☉ Declination.
☉ & ☽ Equator.^{l} distance			Latitude.
☉ Declination		L =	Co-latitude.

NB. When a zodiacal Star or any other is used instead of the Sun, the Star's R.^{t} Ascension must be compared with the Sun's R.^{t} Ascension at the time of Observation, to get the Solar Time of Observation. Either ☉ or ☽ may be nearest to the Meridian, but the Time is best computed from the Sun when ☉ is farthest from Meridian. Co-ar. is Co-sine less Index 10. & Log. of more than 90°. is Log. of Supplement to 180°. When lower Limb is taken add Semid.^{r} & sub. Dip & Ref.^{n} When upper Limb is taken, sub. Semid.^{r} Dip & Ref.^{n}

Published according to Act of Parliament May 20.th 1782 by Samuel Dunn, Fleetstreet LONDON.

S. Dunn inv.^{t} & delin.^{t}

A New FORMULA for LATITUDE, having, Sights of the Sun, & Elaps'd Time; By S. Dunn.

l = Latitude by Reckoning	.	o = Co-latitude	.	Co.ar
d = Decl^{n}. ☉ far à Meridian	.	p = Polar dist	.	Co.ar
n = Alt^{d}. ☉ far à Meridian	.	a = Co-alt	.	
		gns 2	.	
F = Decl^{n}. ☉ near Meridian	.	½ Sum	.	Sine
B = Comp^{t}. ☉ Declination	.	Rem^{r}	.	Sine 2
P = Polar dist. ☉ near Merid^{n}	.		.	Cosine
N = Alt. ☉ near Meridian	.			2
b = Co-alt. ☉ near Merid^{n}	.	t =	.	
H ′ ″		Q =		
Q = Elaps'd Time =	.	T =	.	Sine
1st. Obs^{n}. =	.	F =		Cosine
2^{d}. =	.	G =		Sine
3^{d}. =	.	F =		Sine
4th. =	.	G =		Secant
5th. =	.	A =		Cosine
6th. =	.	N =		Sine
7th. =	.	G =		Secant
		D =		Cosine

NB! 1st The Observation far à Meridian may be at any time of the Day; the other should be as near the Meridian as it can be judged of & taken. 2^{d}. Co-ar. is Co-secant less Index 10. & Log. of more than 90°. is Log. of Supplement to 180°. 3^{d}. When d & F are equal, then p & P are equal. 4th. If Decl^{n}. & Lat. are both North - or both South, subtract Decl^{n}. from 90° but if otherwise, add Decl^{n}. to 90°. to get Polar distance.

A =	.		
B =	.		
C =	.	add if P is under 90°.	else sub.
D =	.		
E =	.	Zenith dist. for F.	
F =	.	Declination.	
	.	Latitude.	
L =	.	Co-latitude.	

Haght. Dip		Haght. Dip		Alt.	Ref.	Alt.	Ref.	Alt.	Ref.	Alt.	Ref.	Alt.	Ref.	Alt.	Ref.
Feet.	′	Feet.	′	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″
1 =	1	43 =	7	. 7	= 33		. 42	= 27		1 . 33	= 21		2 . 50	= 15		5 . 20	= 9		17 . 0	= 3
3½ =	2	57 =	8	. 12	= 32		. 40	= 26		1 . 43	= 20		3 . 7	= 14		6 . 15	= 8		24 . 0	= 2
8 =	3	72 =	9	. 18	= 31		. 50	= 25		1 . 54	= 19		3 . 27	= 13		7 . 15	= 7		47 . 0	= 1
14½ =	4	89 =	10	. 24	= 30		1 . 4	= 24		2 . 7	= 18		3 . 50	= 12		8 . 35	= 6		90 . 0	= 0
22 =	5			. 30	= 29		1 . 13	= 23		2 . 19	= 17		4 . 20	= 11		10 . 15	= 5			
				. 36	= 28		1 . 23	= 22		2 . 33	= 16		4 . 50	= 10		13 . 0	= 4			

Published according to Act of Parliament May 20th 1782 by Samuel Dunn, Fleetstreet, LONDON.

S. Dunn inv^{t}. & delin^{t}.

A New FORMULA for LATITUDE having Sights of STARS, By S. Dunn.

✷		° ′		° ′	
l = Latitude by Reckoning	.	*O* = Co-latitude	.	Co-ar.	.
d = Decl.ⁿ ✷ far à Meridian	.	*p* = Polar dist.ᵉ ✷	.	Co-ar.	.
n = Alt.ᵉ ✷ far à Meridian	.	*a* = Co-alt.ᵉ ✷	.		.
✹			2		.
F = Decl.ⁿ ✹ near Meridian	.	½ Sum	.	Sine	2
B = Compl.ᵗ ✹'s Declination	.	Ranᵗ.	.	Sine	
P = Polar-distance of ✹	.		.	Cosine	.
N = Alt.ᵉ ✹ near Meridian	.		2		
b = Complement of ✹ Alt.	.	*t* =	.		
		Q =	.		
✷'s Right Ascension	.	*T* =	.	Sine	.
✹'s Right Ascension	.	*F* =	.	Cosine	.
Q = ✷ & ✹ Equatorˡ. distance	.	*G* =	.	Sine	.
		F′ =	.	Sine	.
		G =	.	Secant	.
		A =	.	Cosine	.
		N =	.	Sine	.
		G =	.	Secant	.
		D =	.	Cosine	.
		A =	.		
		B =	.		
		C =	.	add if *P* is under 90°.	
		D =	.	diff sub.	
		E =	.	✹ Zenith distance.	
		F′ =	.	✹ Declination.	
			.	Latitude.	
		L =	.	Co latitude.	

NB. 1ˢᵗ. ✹ should be observed as near the Meridian as possible. 2ᵈ. The Altitudes of ✷ & ✹ should be clear'd from Dip & Refraction. 3ᵈ. *C* is the Difference of *A* & *B*. 4ᵗʰ. When *l* is the true Latitude, *t* is the true Distance of ✷ from Meridian & *T* that of ✹. 5ᵗʰ. When *t* is less than *Q* the Altitudes were on different Sides of the Meridian. 6ᵗʰ. When *t* is greater than *Q* the Altitudes were on the same Side of the Meridian. 7ᵗʰ. As *O*, *p*, *a*, are used to find *t*; so use *L*, *p*, *a*, to find *t* correct & then *T* correct. 8ᵗʰ. So use *l*, *a*, *p*, or rather use *L*, *a*, *p*, to find ✷'s true Azimuth; & *l*, *b*, *P*, or rather *L*, *b*, *P*, to find ✹'s true Azimuth. 9ᵗʰ. Co-ar. is Co-secant less Index 10. & Log. of more than 90°. is Log. of Supplement to 180°.

Height. Dip. Feet. ′	Height. Dip. Feet. ′	Alt. Ref. ° ′ ″	Alt. Ref. ° ′ ″	Alt. Ref. ° ′ ″	Alt. Ref. ° ′ ″	Alt. Ref. ° ′ ″	Alt. Ref. ° ′ ″
1 = 1	43 = 7	. 7 = 33	. 42 = 27	1 . 33 = 21	2 . 50 = 15	5 . 20 = 9	17 . 0 = 3
3½ = 2	57 = 8	. 12 = 32	. 49 = 26	1 . 43 = 20	3 . 7 = 14	6 . 15 = 8	24 . 0 = 2
8 = 3	72 = 9	. 18 = 31	. 56 = 25	1 . 54 = 19	3 . 27 = 13	7 . 15 = 7	47 . 0 = 1
14½ = 4	89 = 10	. 24 = 30	1 . 4 = 24	2 . 7 = 18	3 . 50 = 12	8 . 35 = 6	90 . 0 = 0
22 = 5		. 30 = 29	1 . 13 = 23	2 . 19 = 17	4 . 20 = 11	10 . 15 = 5	
		. 36 = 28	1 . 23 = 22	2 . 33 = 16	4 . 50 = 10	13 . 0 = 4	

Published according to Act of Parliament May 20th. 1782 by Samuel Dunn, Fleetstreet London.

S. Dunn inv.ᵗ & delin.ᵗ.

A New Formula for Latitude & Longitude, having Sights of Sun & Moon, or Moon & Stars; By S. Dunn.

For Alt. far à Mend.			Altitudes. ☉ ☽	Distances.	
			° ′ ″	° ′ ″	
	Co.ar.	Co.lat.	Dist. Limbs.	Hours	Prop.t Log.
	Co.ar.	Polar dist.	Rough Central dist.	Hours	Prop.t Log.
		a=Co alt.	Rough Hour		1.st Diff.
	2)		☉ & ☽ Limbs obs.d	Hours	Prop.t Log.
2)	Sine	½Sum	☉ true Semidiameter.	P	Prop.t Log.
	Sine	Rem.r	☽ true Semidiameter.		2.d Diff.
	Cosine		For ☽ Altitude.		1.st Diff.
	2		L=Obs.d dist. Centres.		Rem.r
		=t	Least Alt=	1.st Hours	add
		=Q	Great Alt =	Table I. 2.	Time at Greenwich.
	Sine	=T	L = Co.ar.		
	Cosine	=F	A = Common Log.	Co-lat.	Co.ar.
	Sine	=G	B = Table II.	Polar dist.	Co.ar.
	Sine	=F	is =	☉ Co-Alt.	
	Secant	=G	L = add	2)	
	Cosine	=A	D =	½ Sum	Sine
	Sine	=N	☽ Hor.Par.x = Prop.l Log	Rem.r	Sine
	Secant	=G	☉ Alt. = Cosecant		2)
	Cosine	=D	D. = Sine		Cosine
		=A	1.st Arc = Prop.l Log.	2	° ′ ″
		=B	☽ Hor.Par.x = Prop.l Log.	15)	
add if P is under 90°, else sub		=C	☽ Alt. = Cosecant		
		=D	D = Tangent	Time at the Ship	
Zenith dist.		=E	2.d Arc = Prop.l Log.	Time at Greenwich, past noon.	
Declination.		=F	C = add Arcs if D exceeds 90°.		
Latitude			D = add Co.D, only when 1.st Arc is least, & D is under 90° else sub.		Longitude
			E =		
Q=El. Time. F=☉ Decl.n			F = add if D is under 90°.		
N=Alt. near Mend. B=Co-Decl.n			P = True distance Centres		

Published according to Act of Parliament May 29.th 1782 by Samuel Dunn, Fleetstreet London

S. Dunn inv.t & delin.t

A New FORMULA for Latitude, Time & Azimuth; having Sights of Sun, & Elapsed Time; By S. Dunn.

For Alt. far à Merid.	Account	By Latitude.	Correct.	For Alt. far à Merid.
	Co. ar.	Co. lat.		Co. ar.
	Co. ar.	Polar dist.		Co. ar.
		a = Co-alt.		
	2	sum rem 2		
	Sine	½ Sum		Sine
2	Sine	Rem^r.		Sine 2
	Cosine			Cosine
	2		2	
	= t	t =		
	= Q	Q =		
	Sine = T	T =		Sine
	Cosine = F	F =		Cosine
	Sine = G	G =		Sine
	Sine = F	F =		Sine
	Secant = G	G =		Secant
	Cosine = A	A =		Cosine
	Sine = N	N =		Sine
	Secant = G	G =		Secant
	Cosine = D	D =		Cosine
	= A	A =		
	= B	B =		
add if P is under 90°, else sub.	= C	C =		add if P is under 90°, else sub.
	= D	D =		
Zenith dist.	= E	E =		Zenith dist.
Declination	= F	F =		Declination
Latitude				Latitude

NB. If two Stars are used; Q is the Diff. of their R^t. Ascen^n. or Equatorial Distance.

	For Alt. far à Merid.
Co-lat	Co. ar.
Co-alt	Co. ar.
½ Sum	Sine
Rem^r.	Sine 2
	Cosine
2	
	Azimuth far à Merid.

	For Alt. near Merid.
Co-lat	Co. ar.
Co-alt	Co. ar.
½ Sum	Sine
Rem^r.	Sine 2
	Cosine
2	
	Azimuth near Merid.

1^st. Q is the Elaps'd Time meas^d. by Watch.
2^d. Co—, or Comp^t. is Rem^r. to 90°.
3^d. When Lat. & Decl^n. alike, sub. Decl^n. from 90°. Else, add Decl^n. to 90°, to get Polar dist. 4^th Log. of more than 90°, is Log. of Supp^t. to 180°. 5^th Co-ar. is Cosecant less Index 10. 6^th F is Decl^n. & N Alt. near Merid. B is Co-decl^n.
7^th t & T, correct; are Times from Merid^n. & on one Side when t exceeds Q; else not.

S. Dunn inv^t. & delin^t.

Published according to Act of Parliament May 29th. 1782 by Samuel Dunn, Fleetstreet London.

LONGITUDE Instructions; By S. Dunn.

1. Get the Altitude of the Sun's Centre cleared from Dip & Semidiameter, the Altitude of the Moon's Centre cleared from Dip & Semidiameter, & the Sun- & Moon's nearest Limbs. ..... Add 32' to the observed Distance of Limbs to get the Rough ... Central Distance, with this from Ephemeris ... page 8, 9, 10 or 11 for the Month, where the Day of the Month & Sun are together take out the ... nearest Hour; this is the rough Hour for ... Greenwich.

2. The Ephemeris has the

Sun's true Semidiameter ... page ... 3.
Moon's true Semidiameter ..... 7.
Moon's Horizontal Parallax ..... 7.
Three hourly Distances ..... 8,9.10.11.
Sun's true Declination ..... 2.

The Requisite Tables have the

Seconds for Moon's Altitude .. page 153.
Refraction in Altitude ..... 2.
Moon's Parallax in Altitude ... 3,4,5.
Time & Degrees ..... 6.

3. Begin the Formula with the Rough Central Distance & Rough Hour for Greenwich, & go on as it directs until you come to the Number E in it. Then, in usual Cases, the nearer the .. Rough Central Distance in Degrees, comes to 120°, the greater it is; & the nearer it comes to 20°, the less it is. A great Altitude of the Moon may be that above 20°. When the .. Rough Central Distance in Degrees is great, & especially, when the Moon's Altitude is .. also great; then Number E may be written for the true Distance of Centres.

4. For small Distances, or small Moon's Altitude; Take the Moon's Parallax in Altitude from Requisite Tables page 3, 4, 5; with this & the Distance take the Seconds from large Table IV. Also with Number C & the Distance, take the Seconds from the same Table IV; & the Difference of these Seconds is F.

5. From amongst the three hourly Distances in Ephemeris page 8, 9, 10 or 11, take two such Distances following each other, so that the true Distance of the Centres falls between them; then go on by the Formula till you have the Time at Greenwich; this is past noon for Greenwich.

6. From Ephemeris page 2. take the Sun's true Declination for the Hour at Greenwich; & when the Declination & Latitude are both North or both South, subtract the Declination from 90°; but in other Cases, add the Declination to 90°, to get the Polar distance. And subtract the Sun's Co-altitude from the Half sum to get a Remainder. Then go on by the Formula, 'till you have the Time at the Ship; this will be past Noon at the Ship in an Afternoon Observation, & short of noon in a Forenoon Observation.

7. In an Afternoon Observation, subtract one Time from the other, the Remainder is the Longitude; & it is West Longitude when the Time at Greenwich is greatest, but otherwise East Longitude. In a Forenoon Observation, add the two Times together, the Sum is the Longitude West, & it's Remainder to either 24 Hours or 360°, is East Longitude.

NB. These general Precepts, in several Parts of the Operation, may be shortened, by attending to the following Directions concerning each in particular.

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S. Dunn inv.t & delin.t

Supplementary LONGITUDE Instructions; By S. Dunn.

Of Preparations.

1. When the Sun & Moon's nearest Limbs have been observed; add 32′ to get the Rough Central Distance. Also, add the Sun & Moon's true Semidiameters, & Seconds for Moon's Altitude; to get L.

2. When the Star & Moon's nearest Limb have been observed; add 16′ to get the Rough Central Distance. Also add the Moon's true Semidiameter, & Seconds for Moon's Altitude, to get L.

3. When the Star & Moon's farthest Limb have been observed; subtract 16′ to get the Rough Central Distance. Also, subtract the Moon's true Semidiameter, & Seconds for Moon's Altitude, to get L.

Of Contractions.

1. In taking out the Number from large Table I, the nearest whole Degrees may be used in the most usual Cases.

2. When the Number falls above or near the Crooked Line in large Table I, you need not find the Numbers A, B; but take from large Table III, the Seconds that are to be added to Number L, to give Number D.

3. When the Sun or Moon's Altitude is very small, the Refraction should be taken from the Altitude, before it is written in the Formula, next after the Horizontal Parallax.

4. In computing the Time at the Ship; the third Number or Sun's Co-altitude, is that of the Altitude lessened both by Dip & Refraction.

Of Operations.

1. The Observations should not be made when the Sun or Moon are very near the Horizon. If the Moon is very near the Horizon, Proportional Parts should be used in large Table I.

2. Four Places of Logarithms with Index, are used, till the last Cosine; then the fifth Figure is 5 when 1 remains, & 0 when 0 remains.

3. C must not be added to D, unless the 1st Arc is least of the two Arcs, & at the same time D is less than 90°. In other Cases, subtract C from D.

Of Observations.

1. In observing for Longitude only, without use of a Watch, the Sun should not be very near the Meridian; then Observations will determine Latitude. Also, when the Moon is near the Meridian, Observations will determine Latitude.

2. When the Sun is far à Meridian & not near the Horizon, Observations are best for the Time & setting a Watch.

3. In the Night, the Watch shews Time at the Ship. When no Watch is used in the Night, the Right Ascension of Sun & Star, compared with the Star's distance from the Meridian, either past or short of it, gives Time at the Ship. In this, the Chart of Zodiacal Stars is useful.

4. The Stars of first Magnitude out of the Zodiac, are useful for Time at the Ship; such as Capella, the principal in Orion, Canopus, Sirius, Procyon, Lyra And so may Venus, Mars, Jupiter & Saturn.

5. The same Stars & Planets may be used for Latitude by Meridian Altitudes, Elapsed Time, & otherwise.

6. The principal Stars used in the Lunar Method are, Aldebaran, Pollux, Regulus, Spica, Antares, Aquilæ, Fomalhaut. The others are, Capella, Orion's Sirius, Procyon, Canopus, Arcturus, Lyra; the Bears, Ship & Cross.

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S. Dunn inv.t & delin.t.

A New & Easy FORMULA for LONGITUDE & LATITUDE having Sights only; By S. Dunn.

	° ′ ″	Altitudes.
		☉ ☽
	. .	Dist. Limbs.
		Rough Central dist.
		Rough Hour
	. .	☉ ☽ Limbs obs.ᵈ
	. .	☉ true Semidiamter.
	. .	☽ true Semidiametr.
	. .	For ☽ Altitude.
	. .	L = Obs.ᵈ dist. Centres.
Least Alt =	. .	}
Great. Alt =	. .	} Table I. 2.
L =	. .	Co. ar.
A =	. .	Common Log.
B =	. .	Table II.
as =	. .	
L =	. .	add
D =	. .	
☽ Hor Parˣ =	. .	Propᵗ Log.
☉ Alt. =	. .	Cosecant
D =	. .	Sine
1ˢᵗ Arc =	. .	Propᵗ Log.
☽ Hor Parˣ =	. .	Propᵗ Log.
☽ Alt. =	. .	Cosecant
D =	. .	Tangent
2ᵈ Arc =	. .	Propᵗ Log.
C =	. .	add Arcs if D exceeds 90°.
D =	. .	add C to D. only when 1ˢᵗ Arc is least, & D is under 90°. else sub.
E =	. .	
F =	. .	add if D is under 90°
P =	. .	True distance Centres.
	. .	
Hours	. .	
Hours	. .	
1ˢᵗ Diff.	. .	1ˢᵗ P. Log.
Hours	. .	
P	. .	
2ᵈ Diff.	. .	2ᵈ P. Log.
		1ˢᵗ P. Log.
	″	Rem.
1ˢᵗ Hours	″	add
	. .	Time at Greenwich.

	° ′	
For Alt far à Mend.		
.	Co. ar.	Co. lat.
.	Co. ar.	Polar dist.
.		a = Co alt.
.	2	
	Sine	½ Sum
3	Sine	Remʳ.
	Cosine	
	2	
		= t
		= Q
.	Sine	= T
.	Cosine	= F
.	Sine	= G
.	Sine	= F
.	Secant	= G
.	Cosine	= A
.	Sine	= N
.	Secant	= G
.	Cosine	= D
		= A
		= B
add if P is under 90°, else sub.		= C
		= D
Zenith dist.		= E
Declination.		= F
Latitude		
.	Co. ar.	Co. lat.
.	Co. ar.	Polar dist.
.		Co. alt.
.	2	
	Sine	½ Sum
2	Sine	Remʳ.
	Cosine	
		= t
		= Q
		= T
	″	
Time at Ship		= t.
Time at Ship		= T.
Time at Greenw.		
Longitude.		

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S. Dunn invt delint.

The Right Ascensions and Declinations of Fixed Stars, By S. Dunn.

1785.	R.t Asc.	2.4.6.8.10 Years.	Declination.	2.4.6.8.10 Years.
	° ′	′ change ′	° ′	′ change ′
α Eridanus	22. 25.	1.2.4.5.6.	58.19.S.	1.2.4.5.6. sub.
α Whale's Jaw.	42. 46.	2.3.5.6.8.	3.14.N.	1.1.1.2.2. add.
α Perseus	47. 17.	2.4.6.8.10.	49. 5.N.	0.1.1.2.2. add.
α Aldebaran ..	65. 54.	1.3.5.7.9.	16. 3.N.	0.1.1.1.1. add.
α Capella	75. 12.	2.4.7.9.11.	46. 4.N.	0.0.1.1.1. add.
β Rigel	75. 57.	1.3.4.6.7.	8.27.S.	0.0.1.1.1. sub.
γ Orion	78. 24.	2.3.5.6.8.	6. 8.N.	0.0.0.0.1. add.
α Orion	85. 54.	2.3.5.6.8.	7.22.N.	0.0.0.0.0.
α Canopus	94. 48.	1.1.2.3.3.	52.35.S.	0.0.0.0.0.
α Sirius	98. 56.	1.2.4.5.7.	16.25.S.	0.0.0.0.1. add.
α Castor	110. 12.	2.4.6.8.10.	32.21.N.	0.0.1.1.1. sub.
α Procyon	112. 1.	2.3.5.6.8.	5.47.N.	0.1.1.1.1. sub.
β Pollux	113. 3.	2.4.6.8.9.	28.33.N.	0.1.1.1.1. sub.
β Ship	137. 3.	0.1.1.1.2.	68.50.S.	0.1.1.2.3. add.
α Hydra	139. 16.	2.3.4.6.7.	7.45.S.	1.1.2.2.3. add.
α Regulus	149. 14.	2.3.5.6.8.	13. 0.N.	1.1.2.2.3. sub.
β S. Pointer...	162. 11.	2.4.6.7.9.	57.32.N.	1.1.2.3.3. sub.
α N. Pointer...	162. 34.	2.4.6.8.10.	62.54.N.	1.1.2.3.3. sub.
α Gross	183. 43.	2.3.5.6.8.	61.55.S.	1.1.2.3.3. add.
α Spica	198. 29.	2.3.5.6.8.	10. 2.S.	1.1.2.3.3. add.
α Arcturus ...	211. 29.	1.3.4.6.7.	20.19.N.	1.1.2.2.3. sub.
α Centaur	216. 21.	2.4.7.9.11.	59.57.S.	1.1.2.2.3. add.
α Antares	244. 3.	2.4.5.7.9.	25.56.S.	0.1.1.1.2. add.
α Lyra	277. 25.	1.2.3.4.5.	38.36.N.	0.0.0.0.0.
α Aquilæ	295. 5.	1.3.4.6.7.	8.19.N.	0.1.1.1.1. add.
α Fomalhaut .	341. 26.	2.3.5.7.8.	30.45.S.	1.1.2.3.3. sub.
α Markab	343. 31.	1.3.4.6.7.	14. 4.N.	1.1.2.3.3. add.
γ Pegasus	0. 33.	2.3.5.6.8.	13.59.N.	1.1.2.2.3. add.
α Pole Star	11. 59.	1.1.2.2.3.	88.10.N.	1.1.2.3.3. add.

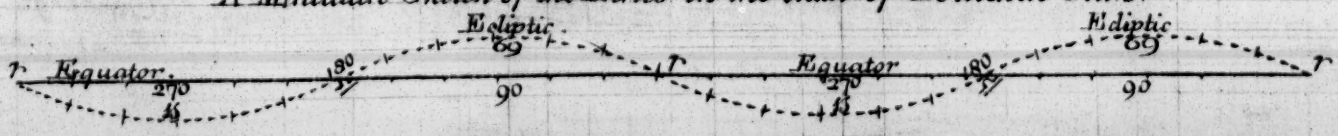
The Change for Years, added to R.t Asc. gives the R.t Asc. required.

The Change for Years, applied to Decl.n gives the Decl.n required.

Note,

The Change in R.t Asc.n is additive. The Change in Declination is as it is written.

A Miniature Sketch of the Lines in the Chart of Zodiacal Stars.



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S. Dunn inv.t delin.t

A Formula for Latitude, having assumed Latitudes, & Elaps'd Time, By S. Dunn.

1st Lat. L. ____

Co.lat. , Co.ar.

Polard. , Co.ar.

1st Co.alt. ____

2)

½ Sum , Sine

Rem.r , Sine ____

2)

, Cosine ____

2

B= ____

2d Lat. l. ____

Co.lat. , Co.ar.

Polard. , Co.ar.

1st Co.alt. ____

2)

½ Sum , Sine

Rem.r , Sine ____

2)

, Cosine ____

2

E= ____

1st Lat. L. ____

Co.lat. , Co.ar.

Polard. , Co.ar.

2d Co.alt. ____

2)

½ Sum , Sine

Rem.r , Sine ____

2)

, Cosine ____

2

A= ____

B= ____ add or sub. A & B to give C, nearest to Q.

∠C= ____

C= , for 1st Lat.

F= ____ for 2d Lat. ____

G= Diff. ____ H= Diff. ____

G= : H :: I : K.

2d Lat. l. ____

Co.lat. , Co.ar.

Polard. , Co.ar.

2d Co.alt. ____

2)

½ Sum , Sine

Rem.r , Sine ____

2)

, Cosine ____

2

D= ____

E= ____ add or sub. D & E to give F. nearest to Q.

∠F= ____

Q = Elapsed Time.

I = Diff. Q & C or Q & F.

K = Correc.n for L or l.

1st. The assumed Co-latitudes, Polar-distances, & Co-altitudes, must be such, that any two of them together, must be more than the third. 2d. Co.ar. is Cosecant, less Index 10. & Log. of more than 90°. is Log. of Supp.t to 180°. 3d When the true Lat. is between those assumed, the Correction converges fast to Truth. 4th. When L is true, B is true Time of 1st. Alt. & A true Time of 2d. Alt. from Noon. The like for E & D. 5th. For Azimuth, work as above, with Co-lat, Co alt. & Polar dist. this gives Azimuth from North in N. Lat. & from South in S. Lat. 6th. When the same Lat. repetes, the Lat. Times & Azimuths are correct.

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S. Dunn inv.t delin.t

A New FORMULA for LATITUDE, having, Sights of the Sun, Elaps'd Time and Equal Declination. By S. Dunn,

l = Latitude by Reckoning	,	o = Co-latitude	, Co. ar. ,
d = Declination	,	p = Polar dist	, Co. ar. ,
n = Alt^{d} ⊙ far a Meridian	,	a = Co Alt	, ,
B = Co-declination	,	gms	, 2 ,
N = Alt^{d} near Meridian	,	½ Sum	, Sine ,
Q = Elapsed Time	,	Rem^{r}	, Sine , 2
			, Cosine ,

Farther Calculations.

Co-latitude

2

t =

Q =

T = , Sine ,

d = , Cosine ,

G = , Sine ,

d = , Sine ,

G = , Secant ,

A = , Cosine ,

N = , Sine ,

G = , Secant ,

D = , Cosine ,

A =

B =

C = , add if p is under 90° else sub.

D =

E = , Zenith dist.

d = , Declination.

, Latitude.

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S. Dunn invt & delint.

The Points & Degrees of the Compass Card, to Halfquarter Points; By S. Dunn.

		Points	D. M.	D. M.					Points	D. M	D. M		
North	South	0	0 . 0	0 . 0	North	South	N. E.	S. E.	4	45 . 0		N. W.	S W
		0 ⅛		1 . 24					4 ⅛		46 . 25		
		0 ¼	2 . 49						4 ¼	47 . 49			
		0 ⅜		4 . 13					4 ⅜		49 . 13		
		0 ½	5 . 37						4 ½	50 . 37			
		0 ⅝		7 . 2					4 ⅝		52 . 2		
		0 ¾	8 . 26						4 ¾	53 . 26			
		0 ⅞		9 . 51					4 ⅞		54 . 51		
N.by E.	S.by E.	1	11 . 15		N.by W.	S.by W.	N.E.bE.	S.E.bE.	5	56 . 15		N.W.bW.	S.W.bW.
		1 ⅛		12 . 40					5 ⅛		57 . 40		
		1 ¼	14 . 4						5 ¼	59 . 4			
		1 ⅜		15 . 28					5 ⅜		60 . 28		
		1 ½	16 . 52						5 ½	61 . 52			
		1 ⅝		18 . 17					5 ⅝		63 . 17		
		1 ¾	19 . 41						5 ¾	64 . 41			
		1 ⅞		21 . 6					5 ⅞		66 . 6		
N.N.E.	S.S.E.	2	22 . 30		N.N.W.	S.S.W.	E.N.E.	E.S.E.	6	67 . 30		W.N.W.	W.S.W.
		2 ⅛		23 . 55					6 ⅛		68 . 55		
		2 ¼	25 . 19						6 ¼	70 . 19			
		2 ⅜		26 . 43					6 ⅜		71 . 43		
		2 ½	28 . 7						6 ½	73 . 7			
		2 ⅝		29 . 32					6 ⅝		74 . 30		
		2 ¾	30 . 56						6 ¾	75 . 56			
		2 ⅞		32 . 20					6 ⅞		77 . 21		
N.E.bN.	S.E.b S.	3	33 . 45		N.W.bN.	S.W.b S.	E by N	E. by S.	7	78 . 45		W. by N.	W. by S.
		3 ⅛		35 . 10					7 ⅛		80 . 10		
		3 ¼	36 . 34						7 ¼	81 . 34			
		3 ⅜		37 . 59					7 ⅜		82 . 58		
		3 ½	39 . 22						7 ½	84 . 22			
		3 ⅝		40 . 47					7 ⅝		85 . 47		
		3 ¾	42 . 11						7 ¾	87 . 11			
		3 ⅞		43 . 30					7 ⅞		88 . 30		
N. E.	S. E.	4	45 . 0		N. W.	S. W.	East.	East.	8	90 . 0		West.	West.

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